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Department of Agriculture

Forest Service

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Route To:

Subject: Trip Report for Pine Mortality and Hazard Trees in Shasta Lake RD (FHP Report No. N11-02)

To: Virginia Beres, Special Uses Staff Officer
Theresa Orr, Special Uses

On December 15, 2010, Forest Health Protection Northern California Shared Service Area staff, Cynthia Snyder (entomologist) and Pete Angwin (plant pathologist), joined Shasta Lake District Special Uses Staff Officer, Virginia Beres, and Special Uses detailer Theresa Orr to look at tree branch flagging and mortality in ponderosa pine and hazard trees at various locations along Shasta Lake. We visited Bridge Bay Resort, Antlers Marina Resort, Antlers RV Park/Campground and Shasta Marina Resort (see attached table) and provided insect/disease identification and management alternatives at the three locations.

The ponderosa pine along Lake Shasta are on extremely harsh sites near 1,000 foot elevation. The ground is rocky with very thin soils. These sites are heavily used and most that we looked at had some degree of pavement and/or hard pack surface for parking. Vegetation is a mix of ponderosa pine, knobcone and grey pine and native oak overstory with manzanita and grass understory. The harsh conditions are often exacerbated by drought, such as occurred 2007-2009.

The 2010 Water Year has been a great improvement. However, the wet spring was followed by a dry summer, conditions which can often result in a different set of consequences. While late spring rains generally benefit tree vigor by extending the growing season and reducing drought stress, increased levels of Diplodia blight (*Sphaeropsis sapinea*) counteract this effect on susceptible trees. The most common problem we noticed was a combination of Diplodia blight and twig beetle (*Pityophthorus* spp.) causing branch flagging throughout the area surrounding Shasta Lake and along the I-5 corridor. This was particularly evident in the ponderosa pine alongside the road entering Bridge Bay Marina (Figure 1).

Diplodia is a foliar blight affecting ponderosa pine which kills the current-year shoots. Outbreaks of the disease on ponderosa pine are associated with wet spring weather and typically occur below 2,000 ft elevation. Generally, Diplodia blight is not a systemic or inherently chronic disease and is often much less serious than the appearance of the tree suggests. The vast majority of diseased trees tend to recover. However, severe levels of infection on an already stressed tree will further weaken the tree, contributing to its decline and predisposing it to attack by other pests.



Many of the trees at Bridge Bay Marina that exhibited symptoms of Diplodia blight also exhibited symptoms of infestation by twig beetles. Trees attacked and colonized by twig beetles exhibit fading needles on twigs and branches, and twig and branch dieback throughout the crown. Typically, this beetle attacks and kills small twigs and branches of drought stressed or otherwise weakened pines. Although twig beetles are generally considered of secondary importance, under favorable conditions they may develop in sufficiently high numbers and attack and kill small trees.

Sequoia pitch moth, *Synanthedon sequoia*, was also noted on many of the stems of small diameter ponderosa pine that had been pruned along the road. In California it most often attacks pines, especially those in urban areas. Sequoia pitch moth is primarily an aesthetic pest; the main effect of larval feeding is copious amounts of unsightly resin often associated with pruning wounds.

There were two ponderosa pine trees at the Bridge Bay Resort that had dead tops and branch flagging indicative of possible pine engraver beetle (*Ips* spp.) attack (Figure 2). In standing trees, fading tops of large trees or whole crowns in small trees can be indicators of *Ips* infestation. The pattern of branch and needle mortality, typically from top down and from inside out, with older needles dying is very different from what is seen with Diplodia blight. Other external evidence consists of accumulations of boring dust in bark crevices and at the base of the tree. Characteristic egg galleries may be found under the bark, slightly engraving the sapwood, hence the common name engraver beetle. Although I was unable to locate *Ips* galleries, it may be that they were just higher than I could reach.

Two mature ponderosa pines at the Antlers Resort had been attacked and killed by western pine beetle, *Dendroctonus brevicornis* (Figure 3). These trees were both near cabins and experienced extra stress due to the 2007-2009 drought and human activity in the area. It is not unusual for highly stressed trees to be attacked by bark beetles, but as long as drought conditions do not return, it is unlikely that there will be increasing mortality in the near future.

Trees with noted defects were pointed out at each of the sites visited and Forest staff questioned us as to the degree of hazard they posed. Hazard trees require both a structural defect that may lead to tree or limb failure and a target that will be hit if the tree or limb fails. Cases where both conditions exist are noted in the attached table.

Management Recommendations

Individual management actions and their prioritization should be the result of discussions between National Forest and Resort management staffs. The highest priority should be given to the reduction of hazard to people and property from falling trees or limbs.

Hazard trees:

Dead trees pose the greatest hazard and should be removed whenever there is a potential target. The dead ponderosa pines near the cabins at Antlers Marina Resort are highly hazardous. The large ponderosa pine at campsite A-87 in the Antlers RV Park and Campground (Figure 4) should likewise be removed or topped. The five dead ponderosa pines and the leaning gray pine

at the parking area of Shasta Marina (Figure 5) should also be removed. Many other trees in the recreation areas were moderately hazardous. Removal of these depends on the degree of risk that the National Forest and Resort management staffs are willing to accept. At the very least, these trees should be closely monitored (see the table below).

Diplodia blight:

Generally, Diplodia blight is not a systemic or inherently chronic disease and is often much less serious than the appearance of the tree suggests. The vast majority of diseased trees tend to recover during years with drier spring weather. However, severe levels of infection on already stressed trees can further weaken them, contributing to their decline and predisposing them to attack by other pests.

Because aerially disseminated fungal spores of *S. sapinea* are always present, pruning-out infected shoots and branches will not control the disease. However, when branches or tops are killed, pruning or removal may be needed to reduce hazard. To prevent infections through wounds, avoid pruning during wet months, especially in the spring. Early fall, while it is still dry, is the recommended time to prune trees that are susceptible to Diplodia blight. Trees that suffer significant amounts of crown dieback or exhibit little or no recovery in subsequent years may be evaluated as candidates for removal.

Fungicide spray applications in the spring, when shoots are susceptible, can prevent infection. However, there are many reasons why chemical control may be impractical:

- environmental conditions that favor infection are infrequent and unpredictable
- accurate timing of fungicide applications is critical to success
- repeated yearly infections on an individual tree may be an indication that the tree is poorly suited to the site or is stressed from other causes.

Twig beetles and Ips:

Twig beetles are generally considered of secondary importance. Typically, this beetle attacks and kills small twigs and branches of drought stressed or otherwise weakened pines. However, under favorable conditions, they may develop in sufficiently high numbers and attack and kill small trees. Pruning may reduce the population level of this insect or the Forest and Resort staff may adopt a “wait and see” approach for the reason that the population may decline on its own as trees recover vigor lost during the past drought.

Trees killed by Ips should be removed where they pose a hazard to people and property. Trees exhibiting topkill will most likely continue to die from the top down. Although the tree may live for a very long time yet, the top will not recover and the beetles will continue to infest small branches until the next drought further weakens the trees to where the beetles can overcome its defenses.

Sequoia pitch moth:

Sequoia pitch moth infestations are generally recognizable by the gray or pinkish pitch masses that protrude from infested trunks and limbs. Pitch masses initially are small, soft, glistening, and reddish brown to pink. As the larva feeds and grows beneath each mass, the gummy exudate enlarges, hardens, and becomes darker gray. Larvae feed beneath the masses and a brownish

pupal case may protrude from the mass after the larva has matured and emerged as an adult. Old pitch masses can remain on bark for several years.

Moths prefer to lay eggs on bark near pruning wounds and other injury sites. No other control aside from minimizing injuries to trees is recommended. Pines are not seriously harmed by this insect. Small limbs infested with larvae and pitch masses can be pruned off, but this may lead to future infestations around the pruning wound. If pines must be pruned, prune only from October through January so that injuries begin to close before the egg-laying adults emerge in spring.

Western pine beetle:

It is not unusual for highly stressed trees to become attacked by bark beetles, but because record drought conditions have ceased, it is not likely that there will be additional mortality at this point in time. Thinning is the usual prescription to reduce bark beetle risk. However, the vegetation density of the Antlers Marina Resort was low enough to properly maintain ponderosa pine.

Location with GPS Waypoint and Coordinates	Comments & Management Recommendations
Bridge Bay Resort WP028 N40°45.237' W122°19.422'	Along the road into the boat launch area and along the edge of the houseboat parking area. Ponderosa pine with dead branch tips (Figure 1). Evidence of Diplodia and twig beetle present. Pitchy tips, beetle larvae, only new shoots affected. Dead tops in two trees, looks like Ips damage. No galleries found. Sequoia pitch moth present with evidence of long-term infestations. This may be due to early season pruning wounds attracting adult moths. Trees in very poor health. Thin, rocky soil, harsh site. Recommend monitoring for potential recovery. Remove trees/branches if they die or become hazardous.
Antlers Marina Resort and RV Park/Campground WP029 N40°53.687' W122°22.278'	Dead ponderosa pine (26" DBH) next to Lodge (Figure 3) with western pine beetle galleries. Dead ponderosa pine (31" DBH) behind Cabin #11 with western pine beetle galleries. No green infested trees found. Remove dead trees to mitigate high hazard potential. Possible hazard tree in RV Park shop area – 28" DBH ponderosa pine grown into the shed with lean and possible cracks. Recommend getting second opinion from certified arborist. Consider possible removal. Site A-44 – ponderosa pine with self-corrected sweep. Not an imminent threat, but warrants continued observation for cracking or springing. Site A-87 – ponderosa pine with 90° corrections after top failure 20+ years ago (Figure 4). There is also a large bole crack present immediately below the old break. This tree is over the camp site and warrants removal or topping to prevent branches from breaking out as weight increases in the future.
Shasta Marina Resort WP030 N40°49.189' W122°19.842'	Five dead ponderosa pines and one green infested ponderosa pine. Western pine beetle and Ips on edge of landing/parking area. One dead knobcone pine – long dead. Recommend removal of dead and green-infested pines. One leaning gray pine – leaning over landing/parking area (Figure 5). Roots are severely undercut on opposite side by adjacent creek. Recommend removal due to high likelihood of failure and numerous potential targets.

We strongly urge that the highest priority treatments be implemented as soon as possible, so that potential hazard may be kept to a minimum. Virginia has mentioned that efforts are already underway to implement hazard tree removals at the resorts. Please let Pete and I know when the removals are complete and what other actions are implemented. We are always available to help assess insect, disease and tree hazard situations.

Please contact me if you have additional questions or need more information.

/s/ Cynthia Snyder
Entomologist

cc: Kristy Cottini, Al Olson, Joshua Wilson, Pete Angwin, Sheri Smith, Phil Cannon, Julie Lydick, Meghan Woods



Figure 1. Diplodia blight and twig beetle damage on ponderosa pine at Bridge Bay Resort, Shasta Lake.



Figure 2. Ips damage on ponderosa pine with Diplodia and twig beetle at Bridge Bay Resort, Shasta Lake.



Figure 3. Dead ponderosa pine next to Lodge at Antlers Marina Resort, Lakehead.



Figure 4. Potential high hazard tree in Antlers RV Park/Campground, site A-87.



Figure 5. Potential high hazard tree at Shasta Marina.